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ABSTRACT

A titanium catalyst for reaction between a
compound having a
 carbon-carbon unsaturated bond and a compound having an
 electrophilic functional group or an electrophilic reagent,
 said titanium catalyst being composed of a titanium compound
 represented by the formula (1) below



(where X^1 , X^2 , X^3 , and X^4 denote independently a halogen atom,
 C_{1-20} alkoxyl group, aralkyloxy group, aryloxy group, or $-\text{NRxRy}$
 group (where Rx and Ry denote independently a C_{1-20} alkyl group
 or aralkyl group), and any two of X^1 , X^2 , X^3 , and X^4 may form a
 ring.) and a Grignard reagent represented by the formula (2)
 below in a molar amount 1.5-2.5 times as much as the titanium
 compound.



(where R^1 denotes a C_{2-10} alkyl group having a hydrogen atom at
 the β position and X^5 denotes a halogen atom.)

The titanium catalyst of the present invention
 activates the carbon-carbon unsaturated bond, which has a
 comparatively low reactivity, thereby catalyzing the reaction
 with an electrophilic functional group. It is inexpensive
 and industrially advantageous. When applied to reaction
compound having a
 between a carbon-carbon unsaturated bond and an electrophilic
 functional group, it yields industrially a variety of adducts
 of a compound having a carbon-carbon unsaturated bond and a
 compound having an electrophilic functional group, and it
 also yields a variety of intramolecular adducts of a compound
 having a carbon-carbon unsaturated bond and an electrophilic
 functional group in the same molecule.

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